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# FCC PART 15.231

# LOW POWER TRANSMITTER TEST REPORT

| | |
|---|---|
| **APPLICANT** | Wayne-Dalton Corp. |
| | 3395 Addison Drive |
| | Pensacola, Fl 32514 USA |
| **FCC ID** | KJ8KYE-372CSW |
| **MODEL NUMBER** | KEP2 |
| **PRODUCT DESCRIPTION** | Keyless Transmitter |
| **DATE SAMPLE RECEIVED** | June 1, 2006 |
| **DATE TESTED** | June 1, 2006 |
| **TESTED BY** | Mario R. De Aranzeta |
| **APPROVED BY** | Frank DeNuzzo |
| **TIMCO REPORT NO.** | 1135AUT6TestReport |
| **TOTAL PAGES** | 12 |
| **TEST RESULTS** | ☒ Pass ☐ Fail |



ACCREDITED
**Certificate # 0955-01**

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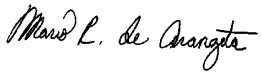
## STATEMENT OF COMPLIANCE

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

**Authorized by:** Mario de Aranzeta

**Signature:** 

**Function:** Engineer

**Date:** June 1, 2006

**Tested by:** Mario de Aranzeta

**Signature:** on file

**Date:** June 1, 2006

## GENERAL INFORMATION

### DUT Specification

| The test results relate only to the items tested. | | | |
|---|---|---|---|
| **DUT Description** | Keyless Transmitter | | |
| **FCC ID** | KJ8KYE-372CSW | | |
| **Model Number** | KEP2 | | |
| **Serial Number** | N/A | | |
| **Operating Frequency** | 372 MHz | | |
| **No. of Channels** | N/A | | |
| **Type of Emission** | N/A | | |
| **Modulation** | FM | | |
| **DUT Power Source** | ☐ 110–120Vac/50– 60Hz | | |
| | ☐ DC Power | | |
| | ☒ Battery Operated Exclusively | | |
| **Test Item** | ☐ Prototype | ☒ Pre-Production | ☐ Production |
| **Type of Equipment** | ☐ Fixed | ☐ Mobile | ☒ Portable |
| **Antenna** | N/A | | |
| **Antenna Connector** | N/A | | |

**Test Facility:** The test sites used by Timco Engineering Inc. for collecting radiated and conducted emission data are located at 849 NW State Road 45 Newberry, FL 32669 USA.

**Test Condition:** The DUT was tested in the laboratory in an environment with normal temperature and humidity. The temperature was 26°C with a relative humidity of 50%.

**Modification to the DUT:** No modification was made to the DUT during testing.

**Test Exercise (e.g software description, test signal, etc.):** The DUT was placed in continuous transmit mode of operation.

**Applicable Standards:** ANSI C63.4: 2003
FCC CFR 47 Part 15.231

**EMC EQUIPMENT LIST**

| Device | Manufacturer | Model | Serial Number | Cal/Char Date | Due Date |
|---|---|---|---|---|---|
| 3-Meter OATS | TEI | N/A | N/A | Listed 1/11/06 | 1/10/09 |
| 3/10-Meter OATS | TEI | N/A | N/A | Listed 3/27/04 | 3/26/07 |
| Analyzer Tan Tower Spectrum Analyzer | HP | 8566B Opt 462 | 3138A07786 3144A20661 | CAL 12/7/05 | 12/7/07 |
| Analyzer Tan Tower RF Preselector | HP | 85685A | 3221A01400 | CAL 12/7/05 | 12/7/07 |
| Analyzer Tan Tower Quasi-Peak Adapter | HP | 85650A | 3303A01690 | CAL 12/8/05 | 12/8/07 |
| Analyzer Tan Tower Preamplifier | HP | 8449B-H02 | 3008A00372 | CAL 12/8/05 | 12/8/07 |
| Analyzer Blue Tower Spectrum Analyzer | HP | 8568B | 2928A04729 2848A18049 | CAL 4/13/05 | 4/13/07 |
| Analyzer Blue Tower RF Preselector | HP | 85685A | 2926A00983 | CAL 9/5/05 | 9/5/07 |
| Analyzer Blue Tower Quasi-Peak Adapter | HP | 85650A | 2811A01279 | CAL 4/13/05 | 4/13/07 |
| Analyzer Silver Tower Spectrum Analyzer | HP | 8566B Opt 462 | 3552A22064 3638A08608 | CAL 12/8/04 | 12/8/06 |
| Analyzer Silver Tower RF Preselector | HP | 85685A | 2620A00294 | CAL 4/27/04 | 12/8/06 |
| Analyzer Silver Tower Quasi-Peak Adapter | HP | 85650A | 3303A01844 | CAL 12/8/04 | 12/8/06 |
| Analyzer Open-Frame Tower Preamplifier | HP | 8449B | 3008A01075 | CAL 8/8/05 | 8/8/07 |
| Antenna: Biconnical | Electro-Metrics | BIA-25 | 1171 | CAL 4/29/05 | 4/29/07 |
| Antenna: Biconnical | Eaton | 94455-1 | 1096 | CAL 8/17/04 | 8/17/06 |
| Antenna: Biconnical | Eaton | 94455-1 | 1057 | CAL 12/12/05 | 12/12/07 |
| Antenna: Log-Periodic | Electro-Metrics | LPA-25 | 1122 | CAL 8/26/04 | 8/26/06 |

## TEST PROCEDURE

**Radiation Interference**: The test procedure used was ANSI STANDARD C63.4-2003 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz. The ambient temperature of the UUT was 98.3°F with a humidity of 40%.

**Occupied Bandwidth:** A small sample of the transmitter output was fed into the spectrum analyzer and the plot in exhibit 9 was generated. The vertical scale is set to 10 dB per division.

**Formula Of Conversion Factors**: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

**Example:**

| Freq (MHz) | METER READING | + ACF | -DCF | +CL | = FS |
|---|---|---|---|---|---|
| 33 | 20 dBuV | + 10.36 dB | -6.00 dB | +1.16 dB | = 25.52 dBuV/m @ 3m |

**ANSI Standard C63.4-2003 10.1.7 Measurement Procedures:** The UUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The UUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings were converted to average readings based on the duration of "ON" time.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

**RADIATION INTERFERENCE**

**Rules Part No.**: §15.231

**Requirements:**

| Fundamental Frequency MHz | Field Strength of Fundamental dBuV/m | Field Strength of Harmonics and Spurious dBuV/m @ 3 meter |
|---|---|---|
| 40.66 to 40.70 | 67.04 | 47.04 |
| 70 to 130 | 61.94 | 41.94 |
| 130 to 174 | 61.94 to 71.48 | 41.94 to 51.48 |
| 174 to 260 | 71.48 | 51.48 |
| 260 to 470 | 71.48 to 81.94 | 51.48 to 61.94 |
| 470 and above | 81.94 | 61.94 |

The limit for average field strength dBuV/m for the fundamental frequency= 78.50 dBuV/m dBuV/m. no fundamental is allowed in the restricted bands.

The limit for average field strength dBuV/m for the harmonics and spurious frequencies = 58.50 dBuV/m dBuV/m. spurious in the restricted bands must be less than 54dbuv/m or 15.209.

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows, these formulas are given in the FCC Rules:
1) for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F)-6136.3636;
2) for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F)-7083.3333.
3) The limit for all unwanted emissions is 20dB below the fundamental.

CALCULATION OF LIMIT @ 372 MHz:

41.6667 (372)-7083.3333 = 8416.667 uV/m
20log(8416.667) = 78.5082dBuV/m limit @ 372 MHz

**Test Data**:

| Tuned Frequency MHz | Emission Frequency MHz | * | Meter Reading dBuV | Ant. Polarity V/H | Coax Loss dB | Correction Factor dB/m | Duty Cycle Factor dB | Field Strength dBuV/m | Margin dB |
|---|---|---|---|---|---|---|---|---|---|
| 372.0 | 356.00 | | 13.5 | V | 1.16 | 14.72 | 10.75 | 18.63 | 39.87 |
| 372.0 | 364.00 | | 22.3 | V | 1.16 | 14.92 | 10.75 | 27.63 | 30.87 |
| 372.0 | 372.00 | | 62.3 | V | 1.17 | 15.14 | 10.75 | 67.86 | 10.64 |
| 372.0 | 380.00 | | 25.2 | V | 1.18 | 15.30 | 10.75 | 30.93 | 27.57 |
| 372.0 | 388.00 | | 14.5 | V | 1.19 | 15.54 | 10.75 | 20.48 | 38.02 |
| 372.0 | 396.00 | | 15.2 | V | 1.20 | 15.66 | 10.75 | 21.31 | 37.19 |
| 372.0 | 744.00 | | 41.2 | V | 1.79 | 20.72 | 10.75 | 52.96 | 5.54 |
| 372.0 | 1,116.00 | ** | 33.6 | V | 2.19 | 27.51 | 10.75 | 52.55 | 1.45 |
| 372.0 | 1,488.00 | ** | 33.0 | V | 2.49 | 28.18 | 10.75 | 52.92 | 1.08 |
| 372.0 | 1,860.00 | | 15.6 | V | 2.79 | 30.36 | 10.75 | 38.00 | 20.50 |
| 372.0 | 2,232.00 | ** | 24.0 | V | 3.06 | 31.85 | 10.75 | 48.16 | 5.84 |
| 372.0 | 2,604.00 | | 21.0 | V | 3.32 | 32.72 | 10.75 | 46.29 | 12.21 |
| 372.0 | 2,976.00 | | 9.3 | V | 3.58 | 33.17 | 10.75 | 35.30 | 23.20 |
| 372.0 | 3,348.00 | ** | 5.8 | V | 3.91 | 33.27 | 10.75 | 32.23 | 21.77 |
| 372.0 | 3,720.00 | ** | 6.0 | V | 4.25 | 33.48 | 10.75 | 32.98 | 21.02 |

## CALCULATION OF DUTY CYCLE

The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100milliseconds. This sweep determines the duration of the pulse train. This sweep allows the determination of the number of and type of pulses, i.e. long & short. Plots are then made showing the duration of each type of pulse and its duration. From the 100millisecond plot the number of a given type of pulse is then multiplied by the duration of that type pulse. This allows the calculation of the amount of time the UUT is on within 100 ms. If the pulse train is longer than 100 ms then this number is multiplied by 100 to determine the percentage ON TIME. If the pulse train is less than 100 ms the total on time is divided by the length of the pulse train and then multiplied by 100 to determine the percentage ON TIME. The average field strength is determined by multiplying the peak field strength by the percent on time converted to dB's. dB = 20*log(% ON time)

SEE SEPARATE EXHIBIT ATTACHED FOR DUTY CYCLE CALCULATION.

## OCCUPIED BANDWIDTH

**Rules Part No.**: 15.231(C)

**Requirements**: The bandwidth of the emission shall be no wider than .25% of the center frequency for devices operating between 70 and 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

372 MHz * .0025 = 0.93 MHz
0.93 MHz/2 = +/- 465 kHz